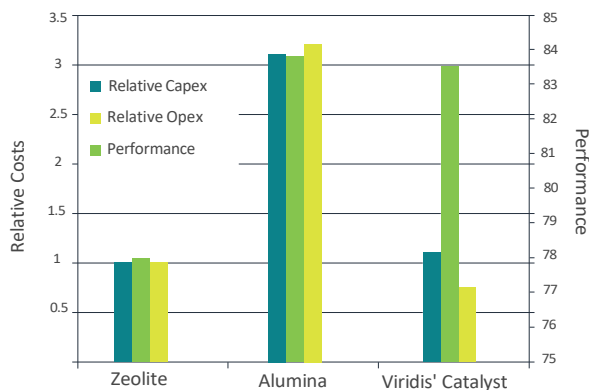


LIGHT NAPHTHA ISOMERIZATION CATALYST – IV-IZOMax^{CAT}



Viridis' light naphtha isomerization catalyst developed in collaboration with Indian Oil Corporation is a highly efficient C₅/C₆ isomerization catalyst that operates at low temperature without additional downstream processing. The catalyst does not need any additional chloride injection thus allowing refiners to obtain high octane isomers with minimal CapEx and OpEx.



IV-IZOMax^{CAT} has high tolerance towards feed contaminants and can handle intermittent moisture upsets of up to 50 ppm. Typical acceptable contaminant limits are given below. In addition, the catalyst does not require a methanator and can handle typical CO+CO₂ levels commonly encountered in the refinery's H₂ production units.

Contaminant Levels	Zeolite Catalyst	Chlorinated Alumina	IV-IZOMax ^{CAT}
Sulfur	50 ppm	0.1 ppm	5 ppm
Nitrogen	1 ppm	0.1 ppm	1 ppm
Water	50 ppm	0.1 ppm	20 ppm
Benzene	< 5%	< 5%	< 5%
C ₇ +			10%

Technology Comparison

	IVIZOMax ^{CAT}	Zeolite	Chlorinated Alumina
Operating Temperature	130-190°C	240-270°C	120-180°C
Additional Inputs	None	None	Chlorine
Downstream Scrubber	No	No	Yes
Exposure to Water (Damage)	Temporary	Temporary	Permanent
Feed Dryer	Not Required	Not Required	Required
H ₂ Dryer	Required	Not Required	Required
Output RON – With Recycle (Feed RON ~ 70-73)	RON 90-91 (RON 82-84-Once Through)	RON 78	RON 91
Capital Requirement	Low	Low	High
Operating Cost	Low	High	Medium
Regenerable	Yes	Yes	No
Catalyst Life	8-10 years	8 years	4 years

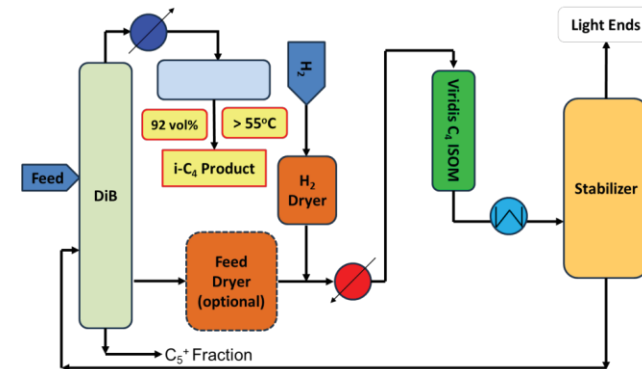
Commercial Reference

IV-IZOMax^{CAT} has been implemented commercially at Indian Oil Bongaigaon refinery in June 2024.



N-BUTANE ISOMERIZATION CATALYST – VC₄ISOMax^{CAT}

Viridis offers highly efficient n-butane isomerization catalyst for production of i-butane. VC₄ISOMax^{CAT} catalyst operates at equilibrium favoring low temperatures and does not require any additional chloride injection for operation. The catalyst operates at low H₂/HC ratio thus eliminating the need for any Hydrogen gas compressor or an additional separator. A typical layout for VC₄ISOMax^{CAT} is shown below for reference; however, the catalyst is highly adaptable for other configurations required by the refiners.



Typical operating parameters for the catalyst are given below for reference.

Parameter	Process Values
Operating Temperature	170-210°C
Pressure (MPa)	1.5 – 3.0
Space Velocity (h ⁻¹)	6-8
H ₂ /HC mole ratio	0.07 to 0.15
Once Through Conversion	52 to 55%
C ₄ ⁺ Selectivity	98% Min
Service Cycle	3 years
Service Life	8-10 years
PGM	Platinum
Supply of Chlorine	Nil
Caustic Scrubber/ Other Wastes	Nil

Parameter	Viridis	Commercial C ₄ Catalyst
Adsorbents	Base - 80%	Base (250K\$)
Chemicals	0	150 K\$/year
Life of Catalyst	8 (Min) to 10 years	4 years
Regenerable	Yes	No
Operators/Labor	Base - 15%	Base
New Unit CapEx	Base - 30%	Base

